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U. S. DEPT. OF AGRICULTURE
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CURRENT SERIAL RECORDS

WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
APR. 1, 1964

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Water Supply Forecasting Unit, Soil Conservation Service, P.O. Box 2807, Portland, Oregon 97208.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
Western United States	Monthly (Feb.-May)	Portland, Oregon	All Cooperators
Basic Data Summary	October 1	Portland, Oregon	All Cooperators
STATES			
Alaska	Monthly (Mar.-May)	Palmer, Alaska	Alaska S.C.D.
Arizona	Semi-Monthly (Jan.15 - Apr.1)	Phoenix, Arizona	Salt R. Valley Water Users Assoc. Ariz. Agr. Exp. Station
Colorado and New Mexico	Monthly (Feb.-May)	Fort Collins, Colorado	Colo. State University Colo. State Engineer N. Mex. State Engineer
Idaho	Monthly (Jan.-June)	Boise, Idaho	Idaho State Reclamation Engineer
Montana	Monthly (Jan.-June)	Bozeman, Montana	Mont. Agr. Exp. Station
Nevada	Monthly (Jan.-May)	Reno, Nevada	Nevada Dept. of Conservation and Natural Resources - Division of Water Resources
Oregon	Monthly (Jan.-June)	Portland, Oregon	Oreg. State University Oregon State Engineer
Utah	Monthly (Jan.-June)	Salt Lake City, Utah	Utah State Engineer
Washington	Monthly (Feb.-June)	Spokane, Washington	Wn. State Dept. of Conservation
Wyoming	Monthly (Feb.-June)	Casper, Wyoming	Wyoming State Engineer

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
British Columbia	Monthly (Feb.-June)	Water Resources Service, Dept. of Lands, Forest and Water Resources, Parliament Blog., Victoria, B.C., Canada
California	Monthly (Feb.-May)	Calif. Dept. of Water Resources, P.O. Box 388, Sacramento, Calif.

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ISSUED

APRIL 1, 1964

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

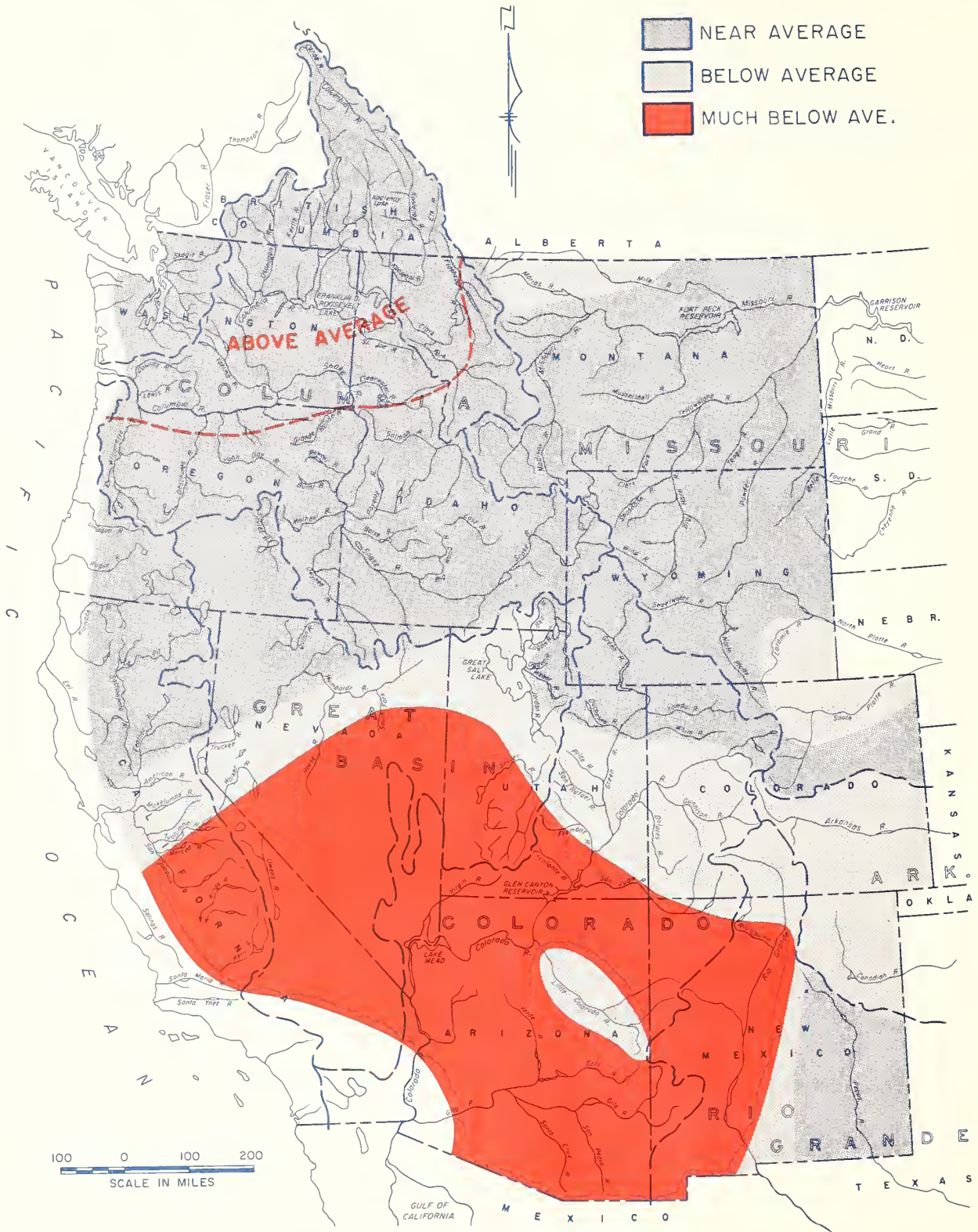
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by Homer J. Stockwell, under the direction of R. A. Work, Head, Water Supply Forecast Unit, Engineering Division, Soil Conservation Service, Portland, Oregon, from data supplied by Snow Survey Supervisors of the Soil Conservation Service: Arizona, Richard W. Enz; Colorado and New Mexico, Jack N. Washichek; Idaho, M. W. Nelson; Montana, Phil E. Farnes; Nevada, Manes Barton; Oregon, W. T. Frost; Utah, Gregory L. Pearson; Washington, Robert T. Davis; Wyoming, George W. Peak.

California....Dept. of Water Resources, V. H. Lemons, Chief, Water Supply Forecast and Snow Surveys Unit.

British Columbia....Dept. of Lands, Forests, and Water Resources, Harry I. Hunter, Meteorologist, Water Resources Service.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D. A. WILLIAMS, ADMINISTRATOR



April - September, 1964
PROSPECTIVE STREAMFLOW
AS OF APRIL 1, 1964

WATER SUPPLY OUTLOOK

as of April 1, 1964

WATER SUPPLY OUTLOOK FOR THE 1964 SEASON VARIES FROM ADEQUATE IN THE PACIFIC NORTHWEST STATES TO A SHORTAGE FOR IRRIGATION PURPOSES FOR THE SOUTHERN ROCKY MOUNTAINS, THE COLORADO RIVER BASIN AND MUCH OF THE CENTRAL VALLEY OF CALIFORNIA.

The favorable water supply outlook for the Pacific Northwest states, which was established by mid-winter, persisted and generally improved toward the end of the snow accumulation season. Similarly, the trend toward a short water supply outlook for the southern half of the western states has remained up to April 1.

The total mountain snowfall during March was above average throughout the western states. This snowfall resulted in increased forecasts of flow for Columbia Basin streams and eliminated much of the threat of local shortages along the upper Missouri tributaries in Montana and Wyoming.

While total water supplies for the Arkansas and Rio Grande are expected to be much less than average, some improvement of the prospective minimum flows of record is indicated because of above average March snowfall in these areas. Forecasts range near three-quarters of average. However, total surface water supplies on these streams, along with irrigated areas of southern Utah and Nevada and the central valley of Arizona, will be much less than usual demands.

As compared to the 1963 water year, water supplies for 1964 in the Pacific Northwest should be somewhat better than for a year ago. Snowmelt season streamflow for the major streams will be much above that of last season. Along tributary streams, water supply is expected to be very comparable. Cool temperatures and late spring and summer precipitation reduced water demands substantially from the usual requirements, which made a less than average water supply appear adequate.

The California Department of Water Resources reports continued unfavorable water conditions throughout California although no critical deficiencies in irrigation supplies are expected. After four continuous months of below normal precipitation, substantially below normal water conditions are indicated even if normal precipitation occurs during the remainder of the season. The Sierra snowpack on which the large Central Valley is dependent for its spring and summer irrigation water, is now down to 65 percent of average for April 1.

Irrigation interests in Nevada have a similar outlook, less than average streamflow, but more than average storage for this date except for Lake Tahoe.

The outlook for streams in southern Utah remains poor, but most irrigated areas of the Salt Lake Basin have fair to good streamflow prospects.

For the North and South Platte areas of Wyoming and Colorado, slightly less than average water supply can be expected, which represents some improvement in recent weeks. The outlook is less favorable than for 1963, because reservoir storage is less than for a year ago.

Storage in irrigation reservoirs tends to be less than average and for this date in 1963. The adverse effects of this storage deficiency are most noted in southern Wyoming, Colorado, New Mexico and Arizona. Storage conditions are most improved in California and Nevada, and on the Snake River watershed in Idaho.

Isolated shortages may occur along smaller streams even where the regional outlook is good. Considerable variation in outlook is indicated between adjacent small watersheds. These are caused by a combination of high demands which require more than an average water supply to satisfy, and unsatisfactory carryover storage or streamflow prospects. Water users with interests in these areas are urged to check local water supply outlook reports.

MISSOURI BASIN

The pattern of near average winter snowfall continued through March over the upper Missouri Basin in Montana and Wyoming. There are still some deficiencies on the headwaters of the North and South Platte. Heavy plains snowfall in central Montana, Wyoming and northeastern Colorado, which occurred near April 1, will provide early season soil moisture.

MONTANA

Mountain snow cover is near average on the

Missouri River tributaries above Three Forks and some 120 percent of average west of the Missouri main stem along the Continental Divide. Further north, some shortages are expected to develop for the Marias and Milk river watersheds. Storage is deficient and streamflow forecasts range near three-quarters of average. Should above average temperatures and deficient precipitation occur during the summer months, late season water supplies would be critical. Outlook along the Musselshell and its tributaries is favorable with above average streamflow in prospect and above average storage for this date.

The flow of the Yellowstone is expected to be near average. Water supplies will be adequate except for late season shortages along Rock Creek and possibly in the downstream areas along the Clark Fork River.

WYOMING

During March and the first few days of April, there was a substantial increase in mountain snow cover as well as heavy snowfall at lower elevations. This snowfall made up most of the mid-winter snow deficiency. Most snow water content measurements reported in the bulletin do not show snowfall near April 1. With this snowfall, snowpack is near average for the season. Close to average flows are anticipated for the Bighorn and Platte drainages. Carryover storage varies widely and is generally below average on the North Platte and its tributaries, the lower Bighorn and the Shoshone. Upper Wind River reservoirs have above average carryover storage.

Outlook for major irrigated areas is good. If summer demands are high, carryover storage for next year on the North Platte will probably be less than the present storage.

COLORADO (South Platte)

Snowfall during March on the headwaters of the South Platte and its tributaries was well above average. Forecasts for streams as they emerge from the mountains now range from 80 percent of average to average. With less than usual storage in smaller irrigation reservoirs, water supplies will not be plentiful for an average demand year, but the outlook is much more optimistic than for a month ago. Water from the Colorado-Big Thompson Project will provide substantial supplemental supplies.

Snowfall has occurred since snow courses were measured near April 1, both in the mountains and high plains areas, which should further improve the outlook.

ARKANSAS BASIN

Streamflow prospects improved during March, but the general outlook for irrigated areas along the Arkansas and its tributaries in Colorado remains poor. The forecast for the Arkansas near Salida has been increased to 70 percent of average. There is very little carryover storage, and opportunities for storage during spring snowmelt will be limited. Storage in John Martin Reservoir is negligible.

Snowpack on the headwaters of the Canadian River in New Mexico is near average for April first. Storage in Conchas Reservoir for the Tucumcari Project is less than half of average and a year ago. Outlook is fair to good depending on summer precipitation.

RIO GRANDE BASIN

Streamflow for the Rio Grande and its tributaries in the San Luis Valley of Colorado will be much less than average but somewhat above the near minimum of record flows anticipated a month ago. Forecast for the Rio Grande near Del Norte is 70 percent of average as compared to a flow of less than 50 percent of average in 1963. There will still be shortages and a dependence on groundwater, but with careful use of water and available storage, the impact of shortage will be less than for many recent years. Snowpack in the Sangre de Cristo Range approaches average for this date.

As in all below average streamflow years, forecasts in percent of average decline for the middle Rio Grande at Otowi Bridge and for inflow to Elephant Butte. Water shortage will be severe along the main river but less so than for 1963.

Snowpack on tributary streams from the southern end of the Sangre de Cristo Range is near average.

Reservoir storage remains poor in the principal reservoirs, El Vado and Elephant Butte. Soil moisture conditions are fair in north central New Mexico valleys but poor in the lower Rio Grande valley of New Mexico and west Texas.

COLORADO BASIN

There was a substantial improvement in snow cover on the contributing watershed areas of the upper Colorado and its tributaries during March. However, because of the extreme snowfall deficiencies during the winter months, snowmelt season streamflow into lower basin reservoirs will be much less than average. Unimpaired inflow to Lake Mead is forecast at 5,700,000 acre-feet for the April-September 1964 period.

With about 3,000,000 acre-feet stored in Lake Powell during approximately the past year, storage in Lake Mead is at the lowest level since the initial storage period about 25 years ago.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS APRIL 1, 1964

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	146	95
Madison	175	95
Gallatin	136	111
Missouri Main Stem	158	121
Yellowstone	135	96
Shoshone	156	94
Wind	108	81
North Platte	107	82
South Platte	85	73
ARKANSAS BASIN		
Arkansas	110	82
Canadian	122	98
RIO GRANDE BASIN		
Rio Grande (Colo.)	112	70
Rio Grande above Otowi Bridge	97	81
Pecos	41	142
COLORADO BASIN		
Green (Wyo.)	129	90
Yampa - White	115	80
Duchesne	115	72
Price	137	75
Upper Colorado	152	83
Gunnison	127	93
San Juan	96	69
Dolores	77	75
Virgin	288	56
Gila	160	89
Salt	312	100
GREAT BASIN		
Bear	126	88
Logan	155	95
Ogden	200	92
Weber	151	82
Provo - Utah Lake	182	79
Jordan	132	90
Sevier	176	56
Walker - Carson	87	60
Tahoe - Truckee	200	70
Humboldt	210	92
Lake Co. (Oregon)		158
Harney Basin (Oregon)	410	94
UPPER COLUMBIA BASIN		
Columbia (Canada)	123	113
Kootenai	159	98
Clark Fork	139	106
Bitterroot	176	109
Flathead	160	108
Spokane	219	122
Okanogan	185	116
Methow	144	93
Chelan	203	113
Wenatchee	131	125

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	142	85
Snake above Hiese, Idaho	137	96
Snake above American Falls Res	178	97
Henry's Fork	202	98
Southern Idaho Tributaries	202	100
Big and Little Wood	146	89
Boise	154	80
Owyhee	449	102
Payette	144	84
Malheur		103
Weiser	274	99
Burnt		107
Powder	204	99
Salmon	129	89
Grande Ronde	218	100
Clearwater	280	132
LOWER COLUMBIA BASIN		
Yakima	293	111
Umatilla	232	129
John Day	343	100
Deschutes	410	102
Hood		107
Willamette		113
Lewis	291	106
Cowlitz	264	104
PACIFIC COASTAL BASIN		
Puget Sound	295	121
Olympic Peninsula	290	100
Umpqua - Rogue	407	110
Klamath	392	111
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	175	70
Feather	235	70
Yuba	270	80
American	165	65
Mokelumne	135	60
Stanislaus	140	55
Tuolumne	95	55
Merced	110	55
San Joaquin	65	50
Kings	80	45
Kaweah	170	60
Tule	300	60
Kern	40	30

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1943-57 period, except for California which is 1931-60.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER APRIL 1, 1964

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1963	FORECAST 1964	
UPPER MISSOURI			
Clark Fork at Chance, Montana	593	555	90
Gallatin near Gateway, Montana	455	523	114
Jefferson at Sappington, Montana	972	962	89
Madison near Grayling, Montana 1/	430	408	91
Missouri near Zortman, Montana 2/		4340	90
Missouri near Williston, N. Dakota 3/	10687	10750	86
Yellowstone at Corwin Springs, Montana	1935	1860	94
Yellowstone at Miles City, Montana		5621	83
Shoshone below Buffalo Bill Res., Wyoming 4/		710	83
Wind at Dubois, Wyoming		80	80
PLATTE			
Clear at Golden, Colorado 5/	64	121	88
North Platte at Saratoga, Wyoming		650	98
Cache LaPoudre near Ft. Collins, Colorado 6/		145	77
ARKANSAS			
Arkansas at Salida, Colorado 7/	277	245	72
RIO GRANDE			
Rio Grande near Del Norte, Colorado 8/	263	350	71
Rio Grande at Otowi Bridge, New Mexico 9/		360	57
Pecos at Pecos, New Mexico *		47	98
UPPER COLORADO			
Animas at Durango, Colorado		350	74
Colorado at Glenwood Springs, Colorado 10/		1200	78
Colorado near Cisco, Utah	1555	2900	71
Colorado near Grand Canyon, Arizona 11/	3843	5700	62
Duchesne near Tabiona, Utah 12/	98	91	73
Green near Greendale, Utah 13/	645	970	75
Green near Green River, Utah 13/	1835	2600	73
Gunnison near Grand Junction, Colorado		1000	72
Price near Scofield, Utah 14/	26	26	65
San Juan near Bluff, Utah 15/	565	630	51
White at Meeker, Colorado		270	81
Yampa at Steamboat Springs, Colorado		250	88
LOWER COLORADO			
Gila near Solomon, Ariz. (Apr-May)	28	9	36
Salt at Intake, Arizona (Apr-May)	72	39	31
Verde above Horseshoe Dam, Arizona (Apr-May)	16	41	63
GREAT BASIN			
Bear at Harer, Idaho 16/		220	74
Logan near Logan, Utah 17/	103	117	82
Ogden, Inflow to Pine View Res., Utah 18/ (Mar-July)	86	128	90
Provo at Vivian Park, Utah 19/	119	125	79
Sevier at Hatch, Utah 20/	20	24	49
Sevier near Kingston, Utah	5	6	20
Humboldt at Palisades, Nevada **	216	155	67
Truckee at Farad, California ** 21/	277	205	80
West Walker near Coleville, California **	173	95	64

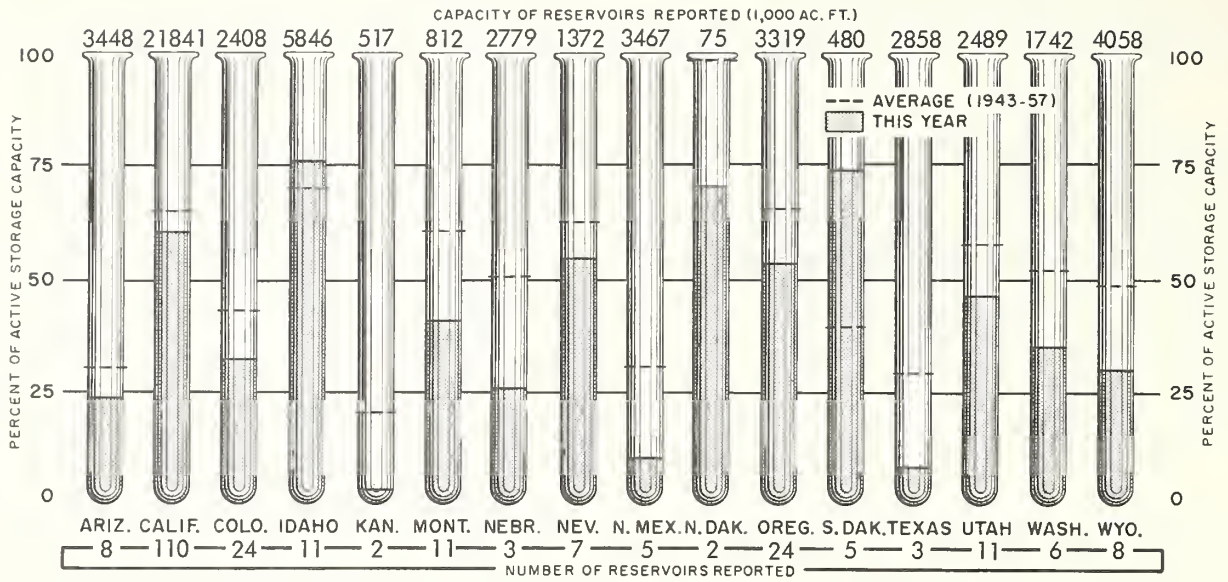
Forecasts in California provided by Department of Water Resources.
Average is for 1943-57 period except California. California is computed for 1911-60 period.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER APRIL 1, 1964

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1963	FORECAST 1964	
UPPER COLUMBIA			
Bitterroot near Darby, Montana	532	588	100
Chelan at Chelan, Washington 22/		1390	108
Clark Fork above Missoula, Montana	1430	2000	110
Clark Fork at Whitehorse Rapids, Montana 23/	10459	14450	104
Columbia at Revelstoke, British Columbia		20500	110
Columbia at Birchbank, British Columbia 24/	41100	44300	104
Columbia at Grand Coulee, Washington 24/	58000	70000	104
Columbia at The Dalles, Oregon 24/	86290	107600	101
Flathead near Polson, Montana 23/	5702	7540	101
Kootenai at Wardner, British Columbia		5200	112
Kootenai at Leonia, Idaho	8001	8920	100
Okanogan near Tonasket, Washington		2000	104
Spokane at Post Falls, Idaho 25/	1823	3400	105
SNAKE			
Big Lost, Inflow to Mackay Res., Idaho 26/	178	150	87
Big Wood, Inflow to Magic Res., Idaho 27/ (Mar-July)	251	270	87
Boise above Diversion Dam, Idaho 28/	1304	1500	87
Clearwater at Spalding, Idaho	6321	9200	101
Malheur near Drewsey, Oregon	65	70	86
Owyhee Res. Net Inflow, Oregon 18/	271	400	93
Payette near Horseshoe Bend, Idaho 29/	1626	1770	88
Salmon at Whitebird, Idaho	6721	6600	92
Snake near Heise, Idaho 30/	3357	3600	87
Snake at Weiser, Idaho	6212	6600	85
LOWER COLUMBIA			
Cowlitz at Castle Rock, Washington		3080	107
Deschutes at Benham Falls, Oregon 31/		530	88
Grande Ronde near LaGrande, Oregon	120	190	94
Hood near Hood River, Oregon 32/	250	375	103
Willamette at Salem, Oregon 33/		5350	98
Yakima near Parker, Washington 34/		2110	107
NORTH PACIFIC COASTAL			
Dungeness near Sequin, Washington		190	112
Rogue at Raygold near Central Point, Oregon	983	975	97
Klamath Lake, Net Inflow, Oregon 35/	572	600	95
CALIFORNIA CENTRAL VALLEY 36/**			
American, Inflow to Folsom Res., Calif.	1755	800	58
Feather near Oroville, Calif.	2653	1130	58
Kaweah, Inflow to Terminus Res., Calif.	332	145	55
Kern near Bakersfield, Calif.	476	195	45
Kings, Inflow to Pine Flat Res., Calif.	1388	560	48
Merced, Inflow to Exchequer Res., Calif.	677	270	42
Mokelumne, Inflow to Pardee Res., Calif.	565	250	52
Sacramento, Inflow to Shasta Res., Calif. 37/	2995	1440	81
San Joaquin, Inflow to Friant Res., Calif.	1413	540	44
Stanislaus, Inflow to Melones Res., Calif.	842	380	52
Tule, Inflow to Success Res., Calif.	65	28	50
Tuolumne, Inflow to Don Pedro Res., Calif.	1435	600	49
Yuba at Smartville, Calif.	1430	720	64

Explanatory Notes on Forecasts Listed on Inside Back Cover.
** April - June Period ** April - July Period*

RESERVOIR STORAGE as of April 1



Average period is 1943-57 except for California, where average period is 1954-63.

Kansas storage is in John Martin and Great Plains Reservoirs in Colorado. Texas storage is in Red Bluff in Texas and Elephant Butte and Caballo in New Mexico. Nebraska storage on North Platte above Kingsley Reservoir in Wyoming and Nebraska.

Reservoir storage data supplied by Bureau of Reclamation, Geological Surveys and water using organizations.

COLORADO

Forecasts of summer flow increased from a month ago to about 70 percent of average for the San Juan up to near 90 percent for the Yampa in western Colorado. Water supply outlook is generally good along the larger streams. Late season shortages should be anticipated for smaller tributaries including those from the Grand Mesa, along the Uncompahgre and in the San Juan Basin served by the Dolores. Flow above Granby will be substantially less than that required to fill Granby Reservoir.

UTAH

Drought conditions which have persisted during the winter months on the Colorado River tributaries in Utah continued during March. Except for the Uinta Basin on tributary streams to the Duchesne, total streamflow is expected to range near one-half of average. A repeat of the water supply conditions of 1963 is the general prospect.

ARIZONA

Surface water supplies for Arizona will be below average. Streamflow forecasts range from 25 to 73 percent of average with the higher flows on the Verde and Tonto rivers which had relatively heavy snowfall during the past few weeks.

Streamflow has been deficient during the winter. Reservoir outflow has consistently exceeded inflow to meet demands for early season irrigation.

Storage and prospective inflow add up to an 80 percent of average surface water supply for the Salt River Project. On the San Carlos Project, surface water supplies will be about 50 percent of average. On both projects, heavy supplemental pumping will be necessary to meet demands.

GREAT BASIN

UTAH

Water supplies for interior basin areas of Utah vary from fair to good. Streams from Utah Lake north to the Idaho state line are expected to provide generally adequate water supplies, although some late season shortages may develop for lands on natural flow rights. March snowfall was above average, bringing substantial improvement in outlook for Bear River tributaries and streams in the Salt Lake City area.

For the Sevier River and most of its tributaries, the outlook remains poor but generally

STORAGE IN LARGE RESERVOIRS — APRIL 1, 1964

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Boysen	560	285
Buffalo Bill	380	125
Canyon Ferry	2043	1726
Hebgen	385	211
Tiber	1316	650
Belle Fourche	185	142
Keyhole	190	73
Fort Peck	19400	11700
Fort Randall	6100	4030
Garrison	24500	12805
Oahe	23600	8532
PLATTE		
Glendo	786	400
Pathfinder	1011	214
Seminoe	982	118
Colo-Big Thompson (4)	865	392
City of Denver (4)	218	92
ARKANSAS		
Conchas	600	100
John Martin	367	9
RIO GRANDE		
Elephant Butte	2207	157
El Vado	194	3
UPPER COLORADO		
Flaming Gorge	3789	872
Navajo	1709	331
Powell	28040	3002
LOWER COLORADO		
Havusu	619	546
Mead	27207	14609
Mohave	1810	1663
San Carlos	1206	51
Salt River Res. (4)	1755	719
Verde River Res. (2)	322	34
GREAT BASIN		
Bear	1421	745
Lahontan	286	220
Rye Patch	179	85
Sevier Bridge	236	56
Strawberry	270	57
Tahoe	732	340
Utah	1149	330

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	583
Coeur d'Alene	238	93
Flathead	1791	723
Hungry Horse	2982	2099
Kootenay	817	147
Pend Oreille	1155	850
Roosevelt	5232	2426
LOWER COLUMBIA		
Detroit	300	284
Hills Creek	351	281
Lookout Point	456	258
Yakima Res. (5)	1065	465
SNAKE		
American Falls	1700	1563
Arrowrock	287	276
Anderson Ranch	423	247
Brownlee	1427	555
Cascade	653	294
Jackson	847	633
Lucky Peak	278	154
Palisades	1202	934
Owyhee	715	363
PACIFIC COASTAL		
Clear Lake	440	412
Upper Klamath	584	106
Ross	1203	805
Trinity	2500	2231
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	716
Berryessa	1602	1559
Cachuma	205	164
Casitas	254	45
Cherry Valley	268	58
Don Pedro	290	205
Folsom	1010	514
Hetch-Hetchy	360	111
Isabella	570	159
McClure	281	175
Millerton	521	282
Nacimiento	350	191
Pardee	210	177
Pine Flat	1013	544
Shasta	4500	3276

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

better than for a year ago. Outlook varies considerably among the smaller tributaries. A few snow courses showed a near average accumulation on April 1.

NEVADA

Water supply outlook remained constant during March with streamflow forecasts east of the Sierra near three-quarters of average. Irrigation water users that derive a part of their supply from reservoirs have a reasonably ample water supply in prospect. Storage is generally above average except for Lake Tahoe. Users with no storage have a much less favorable water supply outlook. On the Carson River, water supplies will be less than, but near normal in the upper valley, and much less than average in the lower reaches near Fort Churchill.

Forecasts for the Humboldt at Palisades is for about 70 percent average flows with near average flow in the upper tributaries in east central and northeastern Nevada. Drought conditions continue in the southern half of the state.

OREGON

Snow cover is well above average in south central Oregon and water supply outlook is good.

COLUMBIA BASIN

Following a record increase in snowpack during January, and a deficiency in February, March snowfall was again well in excess of average. In the upper basin, seasonal snowpack is average or better, up to 125 percent of average in some sections of the Cascade Mountains of Washington and on the Spokane. For the Snake River and its tributaries in Idaho and eastern Oregon, seasonal snowfall totals near average, with well above average snowpack on the Clearwater. The near average seasonal snowfall extends over most of the state of Oregon.

With the exception of two small areas in eastern Oregon, water supply outlook is good for all irrigated areas throughout the basin. The forecast for the Columbia River at The Dalles, Oregon is 107,600,000 acre-feet or 101 percent of average for the April-September 1964 period.

BRITISH COLUMBIA

Spring and summer snowmelt runoff is expected to be quite close to average for most British Columbia rivers. There will be exceptions, and these include above to well above average snowmelt runoff on Lower Coastal, Vancouver Island, and Nechako drainages, where mountain snowpacks are much heavier than those generally on the ground by April 1.

Accumulated valley precipitation for the period November through March is close to normal for the Columbia, Kootenay, and Fraser basins, and slightly above normal for the Thompson, Lower Coastal, and Okanagan-Similkameen basins.

MONTANA

Above average snowfall occurred at higher elevations over the Columbia Basin in Montana during March. Forecasts of streamflow are slightly in excess of average, from 100 to 110 percent for the Kootenai, Flathead and Clark Fork rivers. Water supplies should be adequate for both power and irrigation requirements.

IDAHO

The water supply outlook for Idaho in general is for near normal streamflow throughout the entire state. One exception is the Palouse River which has an extremely heavy snowpack. This small river can be expected to flow heavy volumes of water in 1964.

The general pattern of snow cover has not changed for the entire season. The valley and foothill elevations have an unusually heavy snowpack, although at this time the south slopes have melted off. The high mountainous areas are close to normal or slightly below in most cases.

The soil beneath the snowpack is unfrozen, and the soil moisture sites indicate better than average moisture conditions.

Reservoir stored water in general is good, although a few small reservoirs are still below their average for this time of the year.

The irrigation season has been delayed as a result of the cool temperatures and relatively moist soils in the valleys. No irrigation water is being distributed as yet on the major projects.

OREGON

The water supply for most irrigated areas in Oregon will be adequate for 1964. A major exception is the area served by McKay Reservoir near Pendleton and from Antelope Reservoir near Jordan Valley where storage is much below average. Snowpack increase during March is in excess of usual for the month and overall is near average for the season. Streamflow forecasts range generally from 90 to 100 percent of average. Watershed soils are generally wet and will require very small amounts of water to replace soil moisture deficits. Water in storage is about 80 percent of average and is expected to be adequate except for the reservoirs mentioned above.

WASHINGTON

With well above average snowpack over most of the state at the end of the snow accumulation season, water supplies will be adequate for all irrigated areas and for other purposes for this coming season. Storage in reservoirs on the Yakima and Lake Chelan is below average for this time of year, but prospective inflow is adequate to assure filling.

Mountain soils under the snow are generally wet. Snowpack ranges from slightly less than average on a few snow courses on the Methow drainage up to 125 percent of average on the Wenatchee and Spokane.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that data as of April 1 indicate, with ensuing normal precipitation, the water supply for 1964 will be substantially below normal. Although no critical deficiencies in irrigation supplies are anticipated, some shortages can be expected in localized areas which are without sufficient conservation facilities to meet late season irrigation demands.

March weather was a considerable improvement over the extremely dry February, although precipitation was still below normal, continuing the trend for lower runoff potentials. The accumulated mountain snowpack, the major source of spring and summer runoff, now stands at only 65 percent of average for this date.

Runoff occurring in March ranged from a mere 7 percent of average in the San Francisco Bay area to a high of 63 percent for the month in the Lahontan area. In the Sacramento and San Joaquin Valleys, the March runoff was only 40 percent of average.

Forecasts of April through July runoff for California continue in the range established as of March 1, varying from a low of 43 percent of average for the Merced River to a high of 81 percent for the inflow to Shasta Reservoir. Both April-July and water year runoff will be about 50 percent of average for the San Joaquin Valley and 65 percent of average for the Sacramento Valley. The only improvements in forecasted runoff since the March 1 report were for some of the lower San Joaquin Valley watersheds, where slight increases of up to 10 percent were made.

The South Coastal area had relatively heavy precipitation near the end of March. Although not significant in improving the overall water supply, it was important that it did alleviate a very serious brush and forest fire hazard. For the most part, increases in local runoff were not realized, primarily due to the extremely dry condition of the watersheds.

Despite the fair precipitation during March (70 percent of normal), it was not enough to overcome the deficiencies created by the prevailing dry weather of the previous month. Seasonal precipitation for the water year to date remains substantially below normal throughout California, except for a small area in the Eel River Basin and one south of Bakersfield, which are above normal. Precipitation over the state as a whole, was 70 percent of average for the October through March period.

Snowpack measurements were obtained at approximately 290 snow courses and more than 105 aerial snow depth markers throughout California on or about April 1. Snowpack water content ranged from a low of 30 percent of average for the Kern River in the San Joaquin Valley to a high of 80 percent for the Pit River in the Sacramento Valley. Snowpack for the entire state was only 65 percent of the April 1 average.

March runoff for California was substantially below average, with major streams reflecting the dry February and below normal March. The North Coastal area runoff was only 50 percent of normal for the month, while streams in the Sacramento and San Joaquin valleys experienced only 40 percent of their average. Runoff from other coastal streams in the state was only a small percentage (less than 15 percent) of that normally expected for March. The Lahontan and Colorado Desert areas, the only areas in the state having over 50 percent of average runoff for March, were 55 and 65 percent respectively.

Reservoir storage, despite another month of below normal increases, is still near normal for the state, due to the above average storage carryovers from the previous year.

EXPLANATION of STREAMFLOW FORECASTS

1/ Observed flow adjusted for change in storage in Hebgen Lake. 2/ Observed flow adjusted for change in storage in Canyon Ferry and Tiber reservoirs. 3/ Observed flow adjusted for change in storage in Canyon Ferry, Tiber, Fort Peck, Buffalo Bill, and Boysen reservoirs. 4/ Observed flow adjusted for change in storage in Buffalo Bill Reservoir plus Heart Mt. Diversion. 5/ Observed flow minus diversion through Jones Pass Tunnel.

6/ Observed flow minus diversions from North Platte, Colorado, and Laramie rivers plus measured diversions for irrigation and municipal use above station. 7/ Observed flow adjusted for change in storage in Clear Creek, Twin Lakes, and Sugar Loaf reservoirs minus trans-mountain diversions through Busk-Ivanhoe and Twin Lakes tunnels and Ewing, Fremont, Wurtz, and Columbine ditches. 8/ Observed flow adjusted for change in storage in Santa Maria, Rio Grande, and Continental reservoirs. 9/ Observed flow adjusted for changes in storage in reservoirs listed in (8) plus Terrace, Sanchez, Platoro, and El Vado reservoirs. 10/ Observed flow adjusted for changes in storage in Granby Reservoir plus diversions through Adams Tunnel and Grand River Ditch.

11/ Observed flow adjusted for changes in storage in Flaming Gorge, Navajo, and Lake Powell. 12/ Observed flow plus diversion through Duchesne Tunnel. 13/ Observed flow adjusted for changes in storage in Flaming Gorge and Big Sandy reservoirs. 14/ Observed flow adjusted for change in storage in Scofield Reservoir. 15/ Observed flow adjusted for change in storage in Navajo Reservoir.

16/ Observed flow. 17/ Observed flow plus Utah Power and Light Tailrace and Logan, Hyde Park, and Smithfield canals. 18/ Record computed by Bureau of Reclamation. 19/ Observed flow adjusted for change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake Aqueduct. 20/ Observed flow.

21/ Observed flow exclusive of Lake Tahoe and adjusted for change in storage in Boca Reservoir. Forecast by Truckee Basin Water Committee. 22/ Observed flow adjusted for change in storage in Lake Chelan. 23/ Observed flow adjusted for change in storage in Flathead and Hungry Horse reservoirs. 24/ Observed flow adjusted for change in storage in any or all of the following reservoirs above the station: Kootenay, Hungry Horse, Flathead, Pend Oreille, Coeur d'Alene, F. D. Roosevelt, Lake Chelan, Noxon, and Brownlee; and pumping from F.D.R. Lake. 25/ Observed flow adjusted for change in storage in Coeur d'Alene Lake plus diversions to Spokane Valley Farms and Rathdrum Prairie canals.

26/ Observed flow adjusted for change in storage in Mackay Reservoir plus diversion in Sharp Ditch. 27/ Combined flow of Big Wood near Belleview and Camas Creek near Blaine. 28/ Observed flow adjusted for changes in storage in Lucky Peak, Anderson Ranch, and Arrowrock reservoirs. 29/ Observed flow adjusted for changes in storage in Cascade and Deadwood reservoirs. 30/ Observed flow adjusted for changes in storage in Palisades and Jackson reservoirs.

31/ Observed flow adjusted for changes in storage in Crane Prairie, Wickiup, and Crescent Lake reservoirs. 32/ Adjusted to natural flow. 33/ Observed flow adjusted for changes in storage in Lookout Point, Detroit, Cottage Grove, Dorena, and Hills Creek reservoirs. 34/ Observed flow adjusted for changes in storage in Keechelus, Kachess, Cle Elum, Bumping, and Tieton reservoirs, plus diversions by Rosa, New Reservation, Old Reservation, and Sunnyside canals. 35/ Flow records provided by PP&L and USBR.

36/ All forecasts are for unimpaired streamflow except Kaweah River. 37/ Not corrected for upstream impairments. All other forecasts are for observed flow.

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